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MANAGER PATENT OPERATIONS

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APTOS CORPORATION PTY. LTD.

A U S T R A L I A

Patents Act 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

"A parking management system"

The invention is described in the following statement:

A PARKING MANAGEMENT SYSTEM

The present invention relates to a parking management system and a parking meter and more particularly to a parking management system capable of implementing a variable fee structure for parking fees.

With the advent of compact computers and the proliferation of communication networks, the design of parking meters has progressed steadily. Historically, parking meters have mostly been used as stand alone units for measuring a time interval for which a user pays to park in a particular marked parking position and to indicate whether there is still part of that interval remaining. In one system the meters are connected by a communication link to a control station so that data regarding the amount of money received by each meter may from time to time be transmitted via the links and stored at the control station. Other meters have used sensing technology to determine the presence or absence of a vehicle in a particular parking position. Some meters remain coin or token operated while others may receive payment through a card which stores data relating to a money amount.

One purpose of a parking management system is to assist the owner or manager of the parking area in policing its use. There are a number of issues associated with achieving this purpose, namely: collecting fees from users; enforcing the payment of fines or penalties levied for unauthorised or excessive use of the area; controlling often complex system technology; and providing for the automation of the system so as to reduce the required policing manpower. Ideally, a parking management system should be so self-sufficient that no manpower is required for policing it and it need only be checked occasionally for maintenance purposes. It is desired to achieve this by providing a parking management system which is designed to resolve the above-mentioned issues or at least provide a useful alternative.

The present invention provides a parking management system including:

sensing means for providing information related to the presence or absence of a vehicle in a parking position;

a housing module having:

transaction means for providing electronic funds transfer (EFT) and communicating with a communications network; and

processing means for monitoring said information from said sensing means, controlling said transaction means and for implementing a variable fee structure for parking fees.

The present invention further provides a method for managing a parking system including the steps of:

sensing the presence or absence of a vehicle in a parking position;

selecting one or more fee charging rates from a plurality of fee charging rates applicable under one or more circumstances of use of the system;

obtaining information relating to the payment of fees and authorisation thereof by a user of the system;

establishing a start time from which fees may be charged, the establishing of said start time being responsive to the sensing of the presence of said vehicle in said parking position;

establishing a finish time beyond which fees will not be charged, the establishing of said finish time being responsive to a timing termination signal actuated by a user;

calculating fees to be charged to said user based on said one or more fee charging rates which were applicable under said one or more circumstances of use between said start time and said finish time;

registering a charge against said user using said information, wherein said charge is based on said fees to be charged.

Preferably, said timing termination signal is actuated by either re-entering payment information or by moving the vehicle away from the parking position. A grace period may then be established during which fees may not be charged so as to allow the user to approach his or her vehicle and leave the parking position. If the vehicle remains in the parking position longer than the grace period, excess fees or a fine may be levied against that user and/or a traffic policing authority may be notified.

The present invention further provides a parking management system including:

sensing means for providing information related to the presence or absence of a vehicle in a parking position;

a housing module having:

communication means for communicating with a communications network;

charging means for charging a fee for the use of said parking position; and

processing means for controlling said charging means and said communication means and for implementing a variable fee structure for parking fees, said processing means being adapted to monitor said information from said sensing means.

Preferably, the processing means includes means for providing a variable fee structure wherein parking fees may be charged under one of several fee-charging schemes. A linear fee charging scheme would involve charging the user a set fee per unit of time (ie. rate) which would remain the same over the period of use of the parking position. A non-linear fee charging scheme would involve a changing fee-charging rate over the period of use. A flat-rate charging scheme would entail only one charge for the use of the parking position over an indeterminate period of time (but usually less than 24 hours). Alternatively, the fee-charging rate may be nil for a period of time.

Preferably, the sensing means includes one or more induction coils located at or beneath the surface of one or more respective parking positions; the communication means includes a modem and uses wireless or other media; the housing also having display means for displaying information to a user of the system; the housing also having user interface means for receiving input to the system from a user; the display means and user interface means being adapted to communicate with the processing means.

The present invention also provides a parking meter, including:

means for receiving a presence signal, representative of the presence of a vehicle, from at least one parking bay;

means for obtaining fee collection data from a user of said parking bay which enables

collection of a fee; and

means for selecting at least one charge rate for a predetermined period of time from a plurality of charge rates, for determining a time said vehicle is present in said parking bay, and for determining said fee based on the selected said at least one charge rate and said time.

Advantageously, said charge rate may vary over said predetermined period of time. The charge rate may be low initially and then increased to a high rate when said time reaches a predetermined level. The charge rate may increase linearly or otherwise over said predetermined period of time. A penalty charge rate may be selected after said time reaches a predetermined level.

Preferably the parking meter includes communication means for communicating with a fee collection authority, such as a bank, and/or a management system, such as a central control station. The communication means may also be adapted to communicate with an enforcement authority, such as the police, when said time reaches a predetermined level.

The present invention also provides a method for collecting a parking fee, including:

receiving a presence signal, representative of the presence of a vehicle, from at least one parking bay;

obtaining fee collection data from a user of said parking bay which enables collection of a fee;

selecting at least one charge rate for a predetermined period of time from a plurality of charge rates;

determining a time said vehicle is present in said at least one parking bay in response to said presence signal; and

determining said fee based on the selected said at least one charge rate and said time.

Preferably, the parking management system may be directly connected to a local controller or directly to a control station via a terrestrial, or wireless public or private network. The local controller may also be connected to the control station by via a terrestrial, or wireless

public or private network. The local controller may be connectable to a data communication interface of the control station via a terrestrial, or wireless network, regardless if the network is public or private.

Preferably, the parking management system may further include a transportable retrieval device which in use, is connectable to a parking management system for retrieving data stored in a memory arrangement of said parking management system, the retrieval device also being connectable to a data processing means of the control station, for downloading the information retrieved from said parking management system and stored in the transportable retrieval device.

Preferably, the parking management system may further include a transportable field programming device, the field programming device being connectable to the data processing means of the control station to receive data to be loaded into a parking management system, the field programming device also being connectable to a parking management system to load the data into the memory arrangement of said parking management system.

Preferably, the parking management system may include one or more of the following; means for sensing when an EFT unit is located in the housing, means for sensing when a coin/token unit is located in the housing, and means for sensing when access to the internal components of the housing has been opened.

Preferably, the memory arrangement of the parking management system includes memory means for storing parking meter configuration data. The parking meter configuration data stored in said memory means may selectively be changed by the control station via said communications network.

Preferably, the parking management system may include means for performing diagnostic tests on the parking meter. The memory arrangement of each parking meter may include fault-condition flags and fault occurrence counting means for storing data relating to detected fault conditions. The data relating to fault conditions may be transmitted to the control station

through a communications network.

Each parking meter preferably includes an electronic card authenticator. The memory arrangement of each meter includes operational data regarding the number and value of cards received. The operational data may be transmitted to the control station through a communications network.

Preferably, each parking meter may incorporate an electronic coin or token authenticator. The memory arrangement of the parking meter includes operational data regarding the number and value of coins or tokens received. The operational data may be transmitted to the control station through a communications network.

Preferably, each parking meter may include a real time clock. The processing means and real time clock of each parking meter being adapted to allocate time data to predetermined events and to store said time data and data relating to the kind of event in the memory arrangement. The real time clock on the parking meter may be synchronised with the control station time by the said communications network or the field programming device.

Preferably, the control station may include data output means connected to the data processor, for providing reports in real time based on the processing of the data received from one or more parking meters.

The present invention further includes a method of managing a parking resource including a plurality of demarcated parking positions, the method including the steps of providing one or more parking meters to monitor utilisation of the parking positions; connecting each parking meter, through a communications network, to a control station having processing means; causing each parking meter to regularly perform self-diagnostic tests and to store data relating to those tests; causing each parking meter to store operational data relating to fees received by that parking meter; causing each parking meter to store operational data relating to card transactions performed by that parking meter; causing the parking meters to transmit the data

relating to the self-diagnostic tests or the operational data to the control station in real time; and, at the control station, processing said data in real time and producing results based on the data processed.

The method may also include the step of causing each parking meter to continually sense whether a vehicle is parked in a parking position monitored by that parking meter and transmitting data relating to occupation of that parking position to the control station in real time.

The method may also include the step of causing the parking meter to print tickets, infringements notices, or receipts for vehicles parked in a parking position monitored by that parking meter.

Preferably, parking meter configuration data stored in each parking meter may, from time to time, be updated by transmitting new configuration data from the control station via said communications network.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 shows a block diagram of a preferred embodiment of a parking management system;
Figure 2 is a further block diagram of the parking management system;
Figure 3 shows a block diagram of a parking meter of the parking management system;
Figure 4 is a more detailed block diagram of the parking meter;
Figure 5 is a block diagram of the EFT components of the parking meter; and
Figure 6 is a block diagram of a field programming device and a retrieval machine of the parking management system.

A parking management system , as shown in Figures 1 and 2, includes a plurality of parking meters 12 connected to a control station 14 via communication networks having data

communication links 16. The control station 14 includes a data processor 18, and a data communication interface 20. Each parking meter 12 can monitor one or more parking bays (Figure 2 shows each parking meter monitoring 5 parking bays). Sensors for detecting the presence of a vehicle in a parking bay in the form of vehicle presence detectors 24.1 to 24.N, as shown in Figure 4 (where N is the number of parking bays) are connected to an electronic controller 26 of the parking meter 12. Although other sensors are contemplated, not the least of which are those employing electromagnetic radiation, electromechanical sensors or magneto-resistive sensors, only inductive loop vehicle detectors will be described hereafter. The vehicle presence detector can be located just below the road surface in the parking bay, and/or in the associated curb-side in the vicinity of the parking bay. More than one vehicle presence detector may be required per parking bay to satisfy banking requirements. With the use of more than one vehicle presence detector, the parking meter 12 can also determine the direction and rate of entry of a vehicle to the parking bay. Since the vehicle presence detectors 24.1 to 24.N are connected to the electronic controller 26 of the parking meter 12, providing a binary status indicator for the parking bay is a way of indicating the parking bay occupancy status.

The parking meters are inter-connected in parking meter communication systems 28.1, 28.2 and 28.3, shown in Figures 1 and 2. The parking meter communication system 28.1 may utilise a local network to connect a plurality of parking meters 12 to the local controller 83. The parking meter communication system 28.2 may utilise a local network to connect a plurality of parking meters 12 to the local controller 83, with the local network extended with the use of modems 82 (for example, to traverse a roadway). The local controller 83 in turn is connected to the data communication interface 20 of the control station 14 via modems 84. The parking meter communication system 28.3 may utilise a modem 74 to connect a plurality of parking meters to the data communication interface 20 of the control station 14. Since these systems are similar, only parking meter communication system 28.1 will be described hereafter.

As best shown in Figure 5, each parking meter 12 includes an electronic funds transfer (EFT) unit 105, the electronic controller 26, a keypad 107, display 108, multi-mode reader/writer 112 and an LED panel 109.

Each parking meter 12 has one or more doors (not shown) for allowing access to the inside of the meter housing and which are closed and locked during normal operation. A sensor 58, for determining whether the doors are open, is electronically connected to the electronic controller 26. This allows the system to check whether the doors are open due to vandalism or because of a routine maintenance check. A temperature sensor 64 and a timer 65, including a real time clock 66, are electronically connected to the electronic controller 26. The temperature sensor 64 is for providing temperature calibration to the LCD display 108 so as to obtain the best display quality. An electronic coin/token validator 68 and a speaker/buzzer 57 is connected to the electronic controller 26 and a contact-less smart card transmitter/receiver 113 is connected to the EFT unit 105.

Power for the parking meter is connected to the electronic controller 26 by the power connecter 56, this power supply may include a battery with solar recharge and/or a mains supplied power feed. The power may also be distributed in a multi-core cable along with the parking meter communication system 28.1, 28.2, and 28.3.

Memory 72, connected to the electronic controller 26, is arranged to include a region 72.1 for storing program data for controlling operation of the meter, a region 72.2 for storing configuration data, a region 72.3 including fault condition flags and counters and a region 72.4 for storing operational data, such as the total amount of cash/tokens in the cash/token box and the number of coins/tokens of each denomination in the cash/token box, the number and value of fees processed by the EFT unit 105 and the number and types of cards processed by the EFT unit 105.

Also forming part of the system are a portable field programming device 90 and a portable retrieval machine 96. The field programming device 90 includes a controller having a data interface 92 and memory 94. The retrieval machine 96 includes a controller having a data interface 98 and memory 100. Both of these devices can be connected to the data processor 18 of the control station 14 or the electronic controller 26 of a parking meter 12. The field programming device 90 and/or the retrieval machine 96 may be in the form of a hand-held

portable computer such as a Hewlett Packard HP 620LX.

The field programming device 90 is connectable to the data processor 18 of the control station 14 to receive programme data and/or configuration data and/or synchronised time data. The field programming device 90 may then be connected to the electronic controller 26 of a parking meter 12 to download and store data in the memory 72 of that parking meter. The retrieval machine 96 has a unique identity code stored in its memory 100. When connected to the electronic controller 26 of a parking meter 12, it is interrogated for the code. If the code corresponds to the code stored in the memory 72 of the parking meter 12, predetermined data is loaded from the parking meter 12 into the retrieval machine 96. The data so received is loaded into the data processor 18 of the control station by subsequently connecting the retrieval machine 96 to the data processor 18.

A parking meter 12, with its vehicle presence detectors 24.1 to 24.N, is in continuous communication with the control station 14 via the data lines 16. Data relating to the operation and status of each parking meter 12 may thus be communicated to the control station 14 for real-time processing and control. Such data includes: data indicative of whether a parking bay 22.N is vacant or occupied by a vehicle, this data being generated by the vehicle presence detectors 24.N; data relating to the amount of cash/tokens received by the parking meter during a specified time period or the total amount of cash/tokens in the cash/token box 54; data relating to the card transactions conducted by the parking meter during a specified time period or the total amount of card transactions by the EFT unit 105; data relating to the results of diagnostic tests on the parking meter; or data indicating that a vehicle is parked in a parking bay 22.N during a time period which is not paid for.

The results of diagnostics tests performed on the individual parking meters 12, whether automatically initiated, initiated by the field programming device 90 or directly from the control station 14, are stored in memory region 72.3 and transmitted via the communication lines 16 to the control station 14 or other centralised venue to assist technicians in the maintenance of the meters 12. Memory region 72.3 stores a plurality of fault condition flags and associated fault

condition counters. Together with the real time clock 66, the electronic controller 26 allocates time stamps to fault conditions detected. The fault condition counters count the number of times different fault conditions are detected. This data is then made available to the control station 14.

Configuration data is stored in the memory 72 of each parking meter 12. Such data may relate to card or EFT transaction characteristics, fee changes, operating hours, number of parking bays to be controlled by a parking meter, text to be displayed on display 56 or special days having special rates. Identity codes may be compiled by means of a configuration editor program resident in the data processor 18 at the control station 14 and sent via the communications lines 16, and loaded into the parking meters 12 to be stored in the configuration data region 72.2 of memory 72. In response to the real time clock 66, a parking meter 12 may be required to change on a specified day from an existing tariff table stored in region 72.2 to a new tariff table also stored in region 72.2. Tariff tables for specific groups like the disabled, local residents, shop owners, public transport workers and couriers may be loaded into the parking meters 12 to be stored in the configuration data region 72.2 of memory 72.

The EFT unit 105 has a memory 119 and is connected to the electronic controller 26. The electronic controller 26 passes data to the EFT unit 105 which may be loaded into the operational data part 117 of the EFT memory 119 and which may be displayed on display 108. The multi-mode card reader/writer 112 collects information from a user's card at the start or end of a transaction and stores it in the operational data part 117. The multi-mode reader/writer 112 can simultaneously or individually accept information from the multi-track magnetic stripe reader 111 and/or the integrated chip smart card reader/writer 110. A LED panel 109 and display 108 indicates when to insert or remove a card and displays information such as card or transaction error messages. Contact-less smart cards can also be processed by the contact-less smart card transmitter/receiver 113. The keypad 107 is used to enter the user's personal identification number (PIN) into the EFT unit 105, which is normally a banking requirement for debit card transactions. The keypad 107 may or may not be required for credit or stored value integrated chip smart card transactions or cash/token transactions.

The control station 14 uploads program data to the EFT unit 105 to be stored in the program part 114 of the EFT memory 119 via the communication link 16. Program data can also be transferred to the memory 72 of the electronic controller 26 by the data communication link 16 or the field programming device 90. The electronic controller 26 then transfers the program data to the program part 114 of the EFT memory 119. The field programming device 90 can transfer program data directly to the program part 114.

The control station 14 also uploads configuration data to the EFT unit 105 to be stored in the configuration part 115 of the EFT memory 119 via the communication link 16. Configuration data can also be transferred to the memory 72 of the electronic controller 26 by the data communication link 16 or the field programming device 90. The electronic controller 26 then transfers the configuration data to the configuration part 115 via the EFT unit 105. The field programming device 90 can transfer configuration data directly to the configuration part 115.

The control station 14 can transmit or receive diagnostic data from the EFT unit 105 to be stored in the diagnostic part 116 of the EFT memory 119 via the data communication link 16. Diagnostic data can also be transferred to and from the memory 72 of the electronic controller 26 by the data communication link 16 or the field programming device 90. The electronic controller 26 then transfers the diagnostic data to or from the diagnostic part 116 via the EFT unit 105. The field programming device 90 can also transfer diagnostic data directly to or from the diagnostic part 116.

The control station 14 can transmit or receive operational data to or from the EFT unit 105 and the operational part 117 of the EFT memory 119 via the communication link 16. Operational data can also be transferred to the memory 72 of the electronic controller 26 by the data communication link 16 or the field programming device 90. The electronic controller 26 can then transfer the operational data to the operational part 117 via the EFT unit 105. The field programming device 90 can transfer operational data directly to or from the operational part 117. The electronic controller 26 can transmit or receive operational data to or from the EFT unit 105. Operational data can relate to the text to be printed on the optional printer 55 or the

status of the vehicle presence detectors 22.1 to 22.N.

The electronic controller 26 can determine the operational status of the EFT unit 105 and contents of the EFT memory 119.

During manufacture, the EFT unit 105 may be loaded with encryption programs stored in the EFT memory 119. Also, the EFT unit 105 can be loaded with a unique pad identification number and secret RSA encryption key and stored in the encryption part of the EFT memory 119. When the EFT unit 105 communicates on-line with a bank 103 for the first time, the EFT unit 105 registers with the bank's Key Initialisation Host to authenticate the pad identification number and secret encryption key stored in the encryption part 118. Once verified as the correct EFT unit 105, the bank 103 transfers the Digital Encryption Security (DES) key to the EFT unit 105 to be stored in the encryption part 118.

The vehicle presence detector 24.N identifies when a vehicle enters the parking bay 22.N and the electronic controller 26 commences timing with the timer 65. The parking meter 12 then awaits cash/tokens or card details and the display 56 or 108 directs the user to enter a card. A speaker/buzzer 57 may prompt the user to supply payment or payment details if he or she is slow to do so. The user enters cash or tokens into the coin/token validator 68 or card details into the multi-mode reader/writer 112 and, for debit card transactions, Personal Identification Number (PIN) details by the keypad 107. The card and PIN details are encrypted using the encryption algorithm in the program part 114 of the EFT memory 119 and the secret encryption keys stored in encryption part 118. The EFT unit 105 can process the transaction by one of two methods: firstly by exception-processing of invalid cards, whereby the transaction details associated with valid cards are stored in memory for later processing with the bank 103 or private label card issuing authority 104; secondly, the EFT unit 105 sends the message authentication code (ie. encrypted transaction details) to the electronic controller 26, which then transmits the parking meter details and message authentication code (MAC) to the control station 14 via the communication link 16. The control station then interfaces with the bank 103 or

private label card issuing authority 104 to verify the details of the card and PIN details encrypted in the message authentication code.

The reloading of monetary or other values on stored-value cards (ie. smart cards or combination smart card and magnetic strip cards having a stored value on the card) can be processed by the parking meter 12 using the multi-mode reader/writer 112 and the EFT unit 105 over the communication links 16 with the control station 14, bank 103 or private label card issuing authority 104.

The parking meter 12 can use the communication links 16 with the control station 14 to redeem customer loyalty rewards held in the customer loyalty program 101 as an alternative method of payment.

If the card and PIN details are correct and the transaction is approved, the bank 103 or private label card issuing authority 104 transmits the approval for the transaction to the control station 14 which in turn transmits the approval to the EFT unit 105 via the electronic controller 26 and communication link 16. At the end of the period during which the vehicle is in a parking position, and immediately prior to departure, a user may end the transaction. If a printer 55 is installed, a receipt for the transaction can be requested and printed. If a receipt is requested, a grace period will be allowed to permit the user to return to the vehicle and drive it away. If the vehicle is not driven away before the expiration of the grace period, the change will be re-activated from the time of the commencement of the grace period, and the charging will continue until either the vehicle is driven away, or a further request is made for a receipt. The fees will then be charged to the user's card account.

If the card or PIN details are incorrect or the transaction is not approved, the bank 103 or private label card issuing authority 104 transmits the disapproval for the transaction to the control station 14 which in turn transmits the disapproval to the EFT unit 105 via the electronic controller 26 and communication link 16 and the EFT unit 105 displays the

decline of the transaction to the display 108.

If the bank 103 or private label card issuing authority 104 determines that a card may have been used fraudulently, the bank 103, private label card issuing authority 104, or control station 14 can notify the appropriate policing authority of the location and time where the alleged fraud took place, and whether the vehicle present in the parking bay 22.N at the time of the alleged fraud is still there.

When the vehicle presence detector 24.N identifies that a vehicle has departed the parking bay 22.N or if the parking arrangement is otherwise terminated, the EFT unit 105 calculates the total time the vehicle was in the parking bay and applies linear, and/or non-linear, and/or stepped tariffs to calculate the fee associated with parking in the parking bay for that period of time. Transaction details are then encrypted and the EFT unit 105 sends the message authentication code to the electronic controller 26. The electronic controller 26 then transmits the details of the parking meter 12 and message authentication code to the control station 14 via the communication link 16. The control station then interfaces with the bank 103 or private label card issuing authority 104.

Linear tariffs are those which are constant for each unit of time, eg. $20 per day or $6 per hour. Non-linear tariffs are those which increase or decrease the fee per unit of time over a longer period of time, resulting in a fee which exponentially increases or which asymptotically reaches a maximum. Stepped tariffs involve charging a base linear or non-linear charge and then charging an increased fee at a specified time. Stepped tariffs are used as the basis for levying fines for overstaying the paid time in the parking position.

Locations and times may be designated as "Parking permitted", "Parking restricted" or "Parking not permitted".

"Parking permitted" means that any vehicle may park in the parking position and pay the appropriate fee.

"Parking restricted" means that only certain classes of user may occupy the parking bay 22.N, for example, a resident with special parking rights, with or without a fee, who enters a special identification information into the meter 12.

"Parking not permitted" means that no vehicle is permitted to park in the parking position at any time while the "Parking not permitted" signal, in whatever fashion, is displayed.

The duration of a time block which will attract a set fee may be varied. For example, the chargeable time block may be set at seconds, minutes, hours, days, or multiples thereof. Once the vehicle remains in the parking position for part of the time block, the tariff chargeable will be a set monetary amount which will permit occupation of the parking position by that vehicle for the whole of the remaining time in that time block.

The control station 14 may also interface with customer loyalty programs 101 to facilitate earnings rewards for using the system. The control station 14 may also provide details on occupancy, faults, trends, damage, electronic funds transfer or other relevant information. Authorized organisations may be granted access to receive information to the extent that their authorization allows. The appropriate authorized municipality 102 may interface with the central control station to update, add, or modify control parameters for parking meters in their domain.

Data relating to the total amount of card transactions received by each parking meter 12 can be reconciled with the bank 103 or other card issuer 104 at the control station 14.

The electronic controller 26 of each parking meter 12 is adapted, upon a signal from the vehicle presence detector 24 that a vehicle has departed, to reset the timer 65, every time a vehicle leaves the parking bay 22.N, thereby increasing revenue from the parking meter 12 (because the next user will not be able to use unexpired time paid for by the previous user). Further, data indicating that a vehicle is parked in a parking bay 22.N during a time period not paid for is accessible from the control station 14. This data may be used to

direct the relevant policing authority to such a parking bay 22.N for further action.

If the card used to initiate the fee payment transaction is reinserted into the multi-mode card reader/writer 112 or the contactless smart card transmitter/receiver 113, the EFT unit 105 will then immediately calculate the total amount of fees owing and transmit it to the control station 14.

Data relating to the distribution of vehicles over a parking resource as a whole is accessible from the control station 14 at any time. Accordingly, vehicles may be routed to areas of the parking resource which are under-utilised. Alternatively, the standard or variable tariffs for parking areas of higher use may be increased and those for areas of lower use may be decreased. This would facilitate a more even distribution of vehicles over the parking resource and thus help to manage the parking resource more effectively.

Parking meter municipalities 102 can communicate with the control station 14 and via the data communication interface 20 so as to access data relating to parking resources they possess rights to. They may also upload into the data processor 18 new fee schedules, tariff changes or changes in the availability of particular parking meters 12 or bays 22.N.

All communications between the control station 14 and parking meters 12 take place over a communications network 16. The parking meters 12 act as slaves to the data processor 18. A parking meter generally transmits data in response to being polled by the control station 14, local controller 83, when an EFT transaction is being processed or when a programmed event occurs in the parking meter 12.

It is anticipated that it may be necessary to allow for a grace period during which a car may have been sensed as occupying a parking position but for which the user is not charged. This is to allow time for the user to approach the nearest meter, decide on a method of payment and enter either payment or payment information, after which entering, charges for use of the parking position may accrue.

No grace period is necessary at the end of the timed parking period. In the case of payment by cash or smart card, the whole of the period of the timed parking arrangement will have been pre-paid. In the case of payment by debit or credit card, the charge will be automatic on departure of the vehicle from the parking position. In the case of payment by debit or cred card, should the user require a receipt for the parking payment, the charge, and therefore the receipt, will cover the period of time up to the end of the current time block for that meter.

The system uses vehicle detection to charge a user from the time the vehicle enters to the time the vehicle exits the parking position, and allows the fees attributable to the whole period of use to be automatically debited to the user's account after the vehicle departs. Within the grace period after the vehicle arrives, the user nominates the account to be used by using a valid payment mechanism. Valid payment mechanisms include, but are not limited to, standard credit or debit cards incorporating a magnetic stripe and/or magnetic smart card or integrated chip card issued by recognized financial institutions participating in electronic funds transfer or other authorized private label card issuing authorities, as well as the redemption of customer loyalty rewards.

It will be appreciated that there may be many variations made to the system according to the present invention without departing from the scope of the present invention.

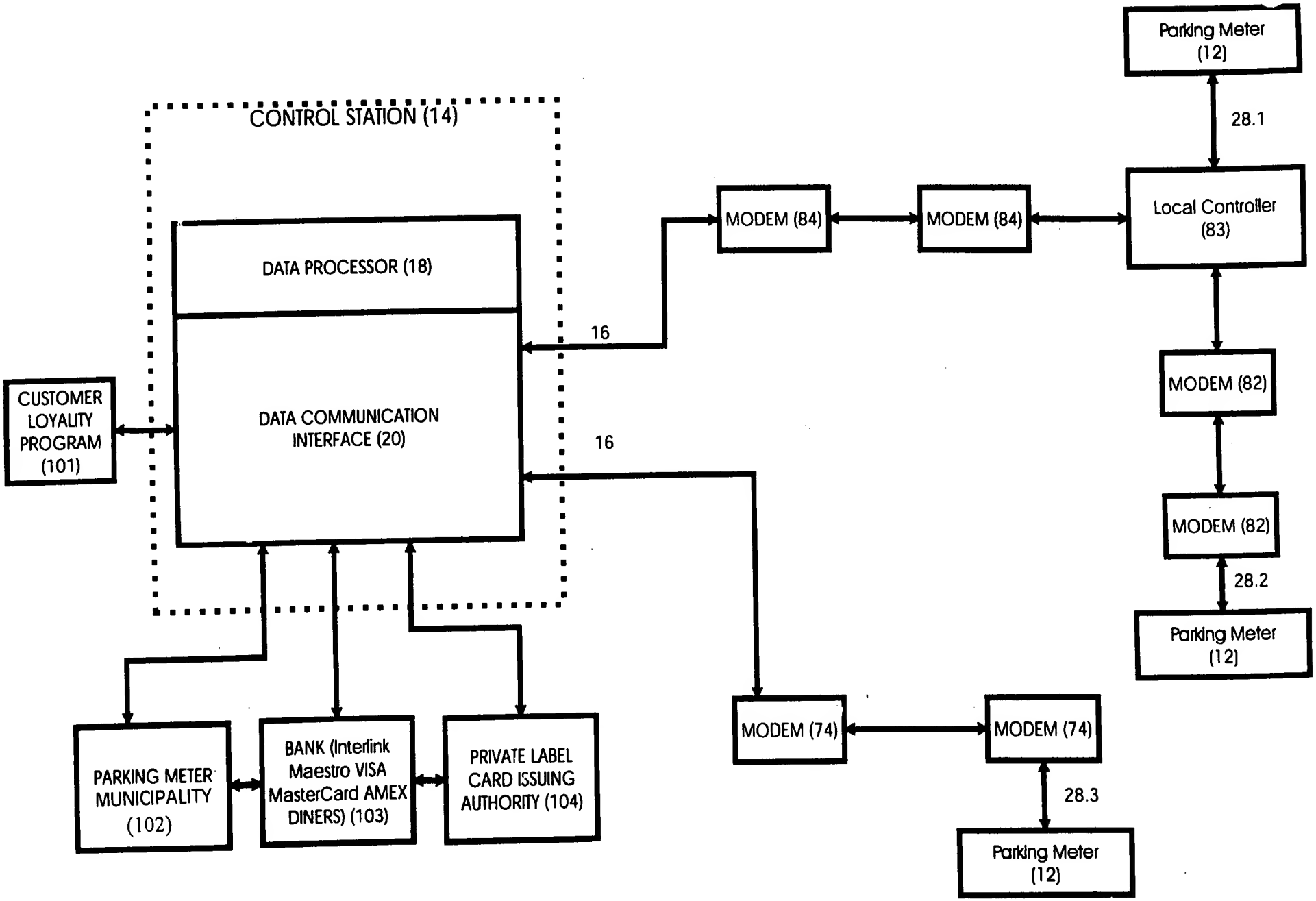

CONTROL STATION (14)
DATA PROCESSOR (18)
DATA COMMUNICATION INTERFACE (20)
CUSTOMER LOYALITY PROGRAM (101)
PARKING METER MUNICIPALITY (102)
BANK (Interlink Maestro VISA MasterCard AMEX DINERS) (103)
PRIVATE LABEL CARD ISSUING AUTHORITY (104)
16
16
MODEM (84)
MODEM (84)
MODEM (74)
MODEM (74)
Local Controller (83)
MODEM (82)
MODEM (82)
Parking Meter (12)
Parking Meter (12)
Parking Meter (12)
28.1
28.2
28.3

FIGURE 1

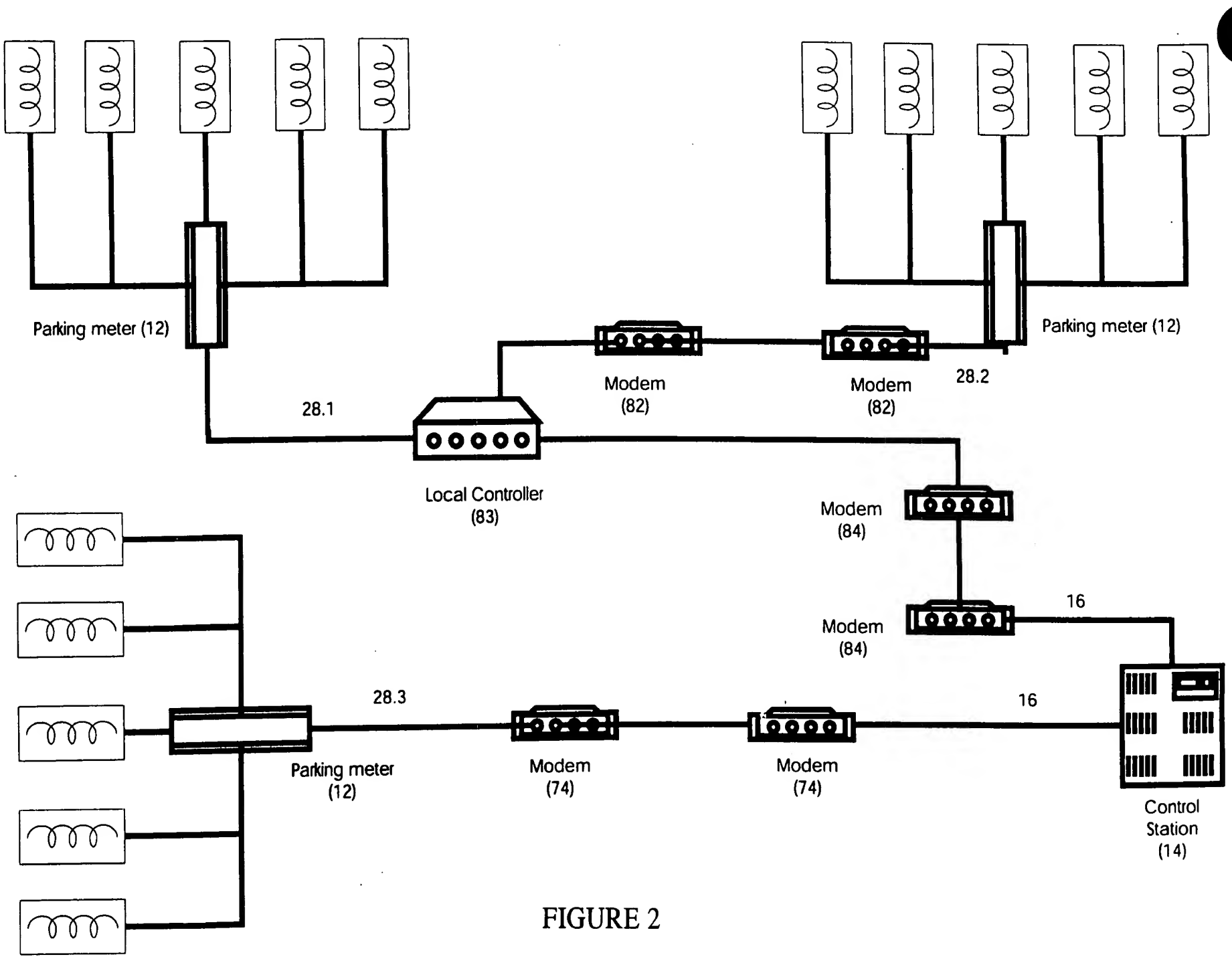

Parking meter (12)
28.1
Local Controller
(83)
Modem
(82)
Modem
(82)
28.2
Parking meter (12)
Modem
(84)
Modem
(84)
16
Parking meter
(12)
28.3
Modem
(74)
Modem
(74)
16
Control
Station
(14)

FIGURE 2

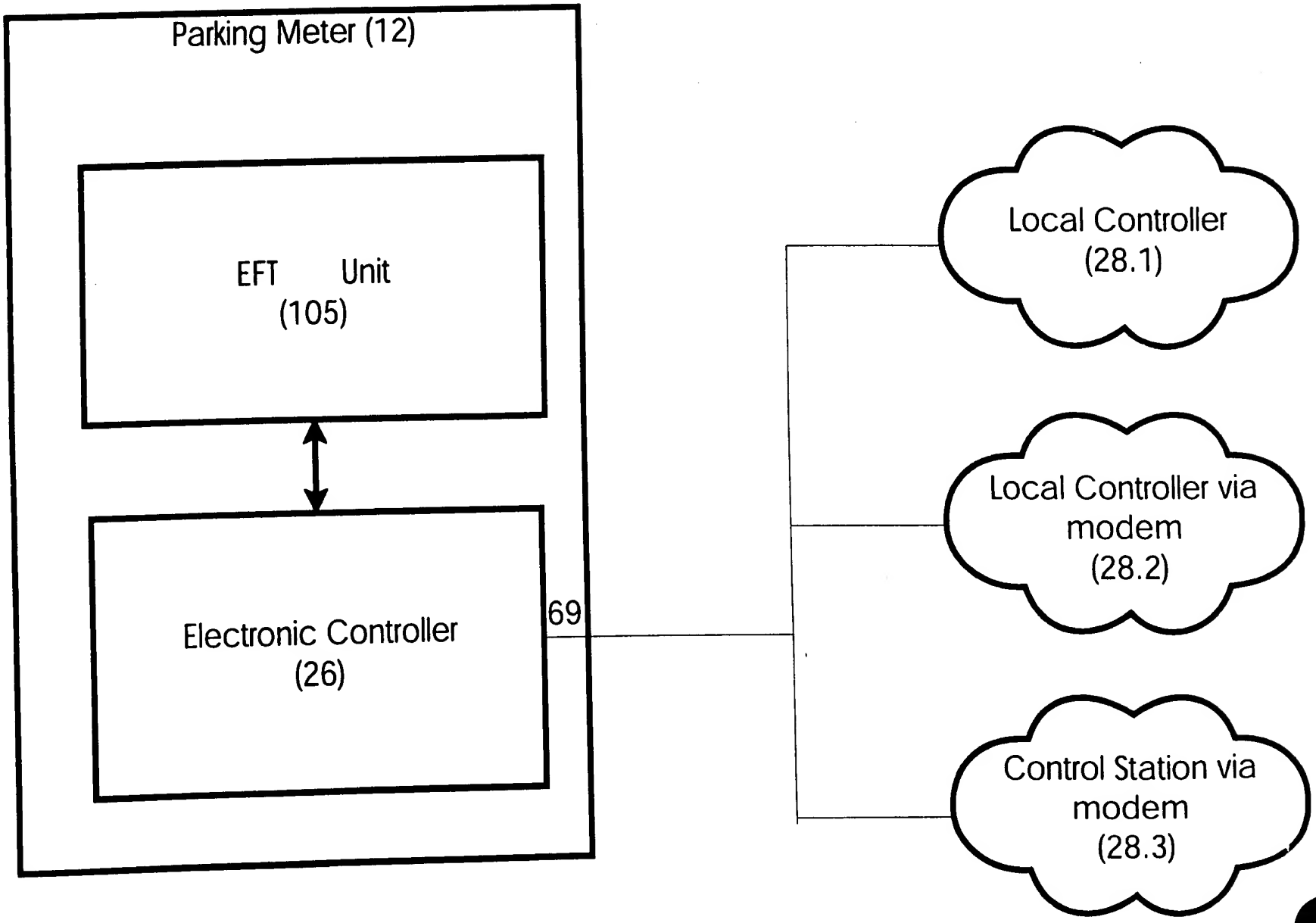

Parking Meter (12)
EFT Unit
(105)
Electronic Controller
(26)
69
Local Controller
(28.1)
Local Controller via
modem
(28.2)
Control Station via
modem
(28.3)

FIGURE 3

FIGURE 4

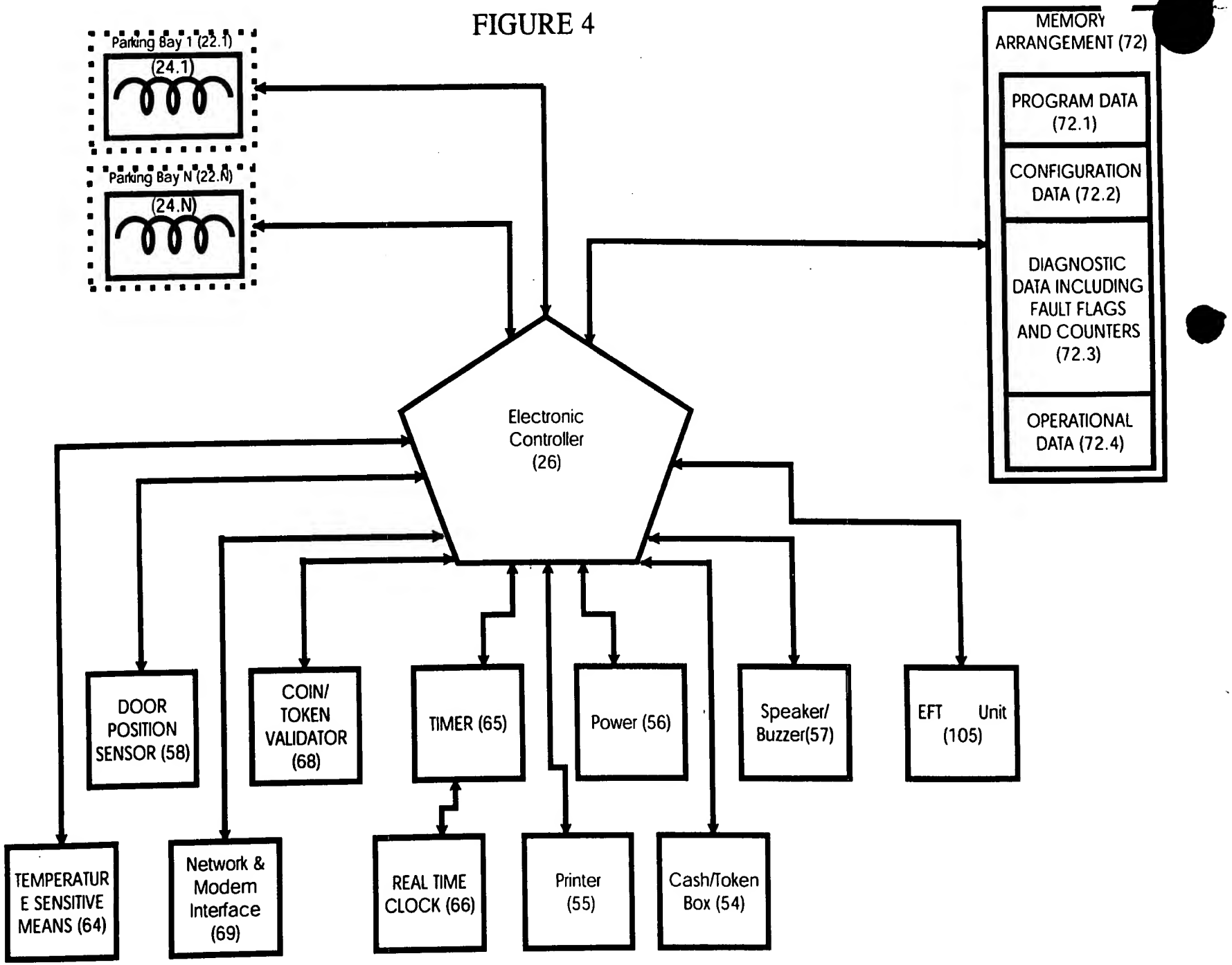
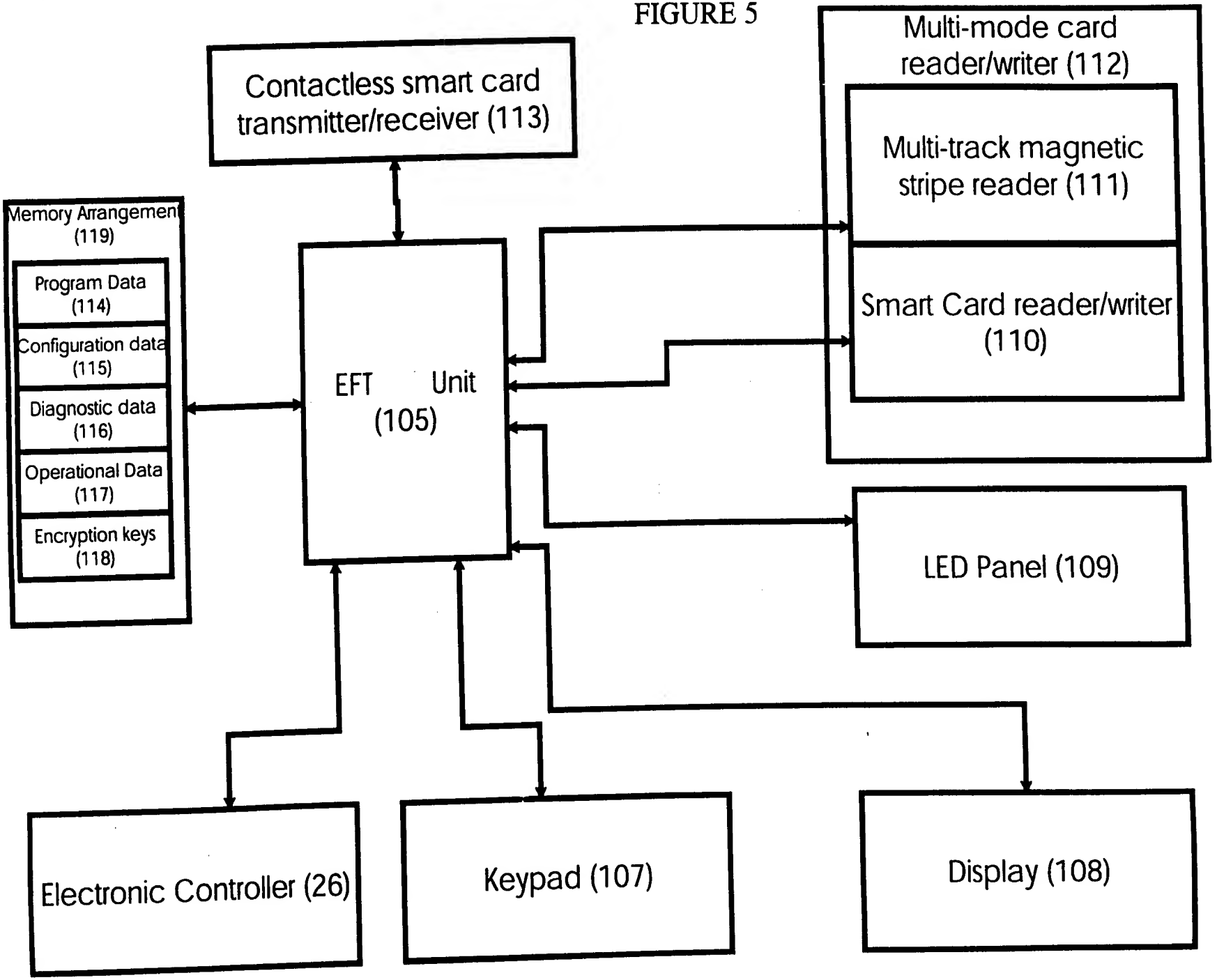

Parking Bay 1 (22.1)
(24.1)
Parking Bay N (22.N)
(24.N)
MEMORY ARRANGEMENT (72)
PROGRAM DATA (72.1)
CONFIGURATION DATA (72.2)
DIAGNOSTIC DATA INCLUDING FAULT FLAGS AND COUNTERS (72.3)
OPERATIONAL DATA (72.4)
Electronic Controller (26)
DOOR POSITION SENSOR (58)
COIN/ TOKEN VALIDATOR (68)
TIMER (65)
Power (56)
Speaker/ Buzzer(57)
EFT Unit (105)
TEMPERATUR E SENSITIVE MEANS (64)
Network & Modem Interface (69)
REAL TIME CLOCK (66)
Printer (55)
Cash/Token Box (54)

FIGURE 5


Contactless smart card transmitter/receiver (113)
Multi-mode card reader/writer (112)
Multi-track magnetic stripe reader (111)
Smart Card reader/writer (110)
Memory Arrangement (119)
Program Data (114)
Configuration data (115)
Diagnostic data (116)
Operational Data (117)
Encryption keys (118)
EFT Unit (105)
LED Panel (109)
Electronic Controller (26)
Keypad (107)
Display (108)

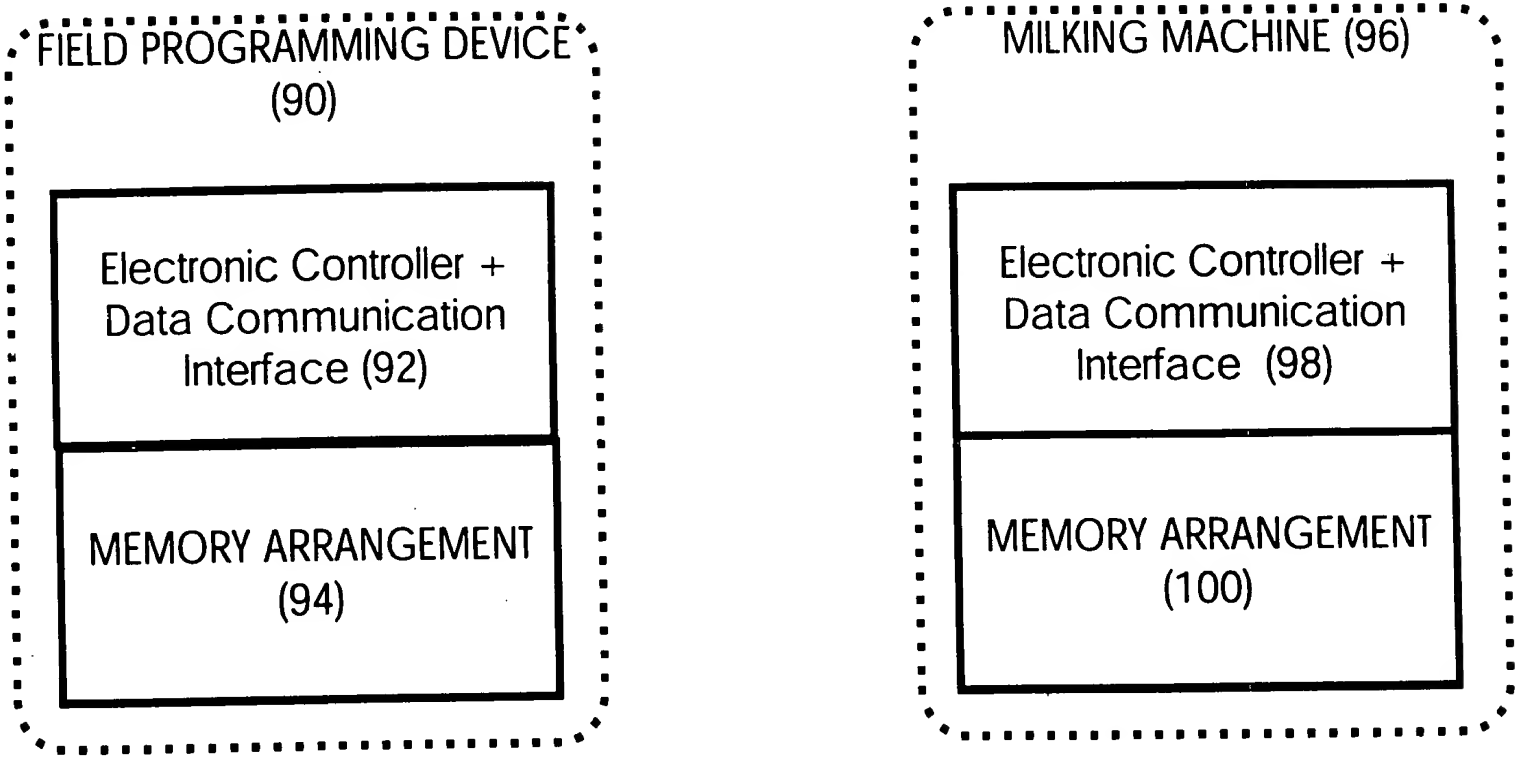

FIELD PROGRAMMING DEVICE
(90)
Electronic Controller +
Data Communication
Interface (92)
MEMORY ARRANGEMENT
(94)
MILKING MACHINE (96)
Electronic Controller +
Data Communication
Interface (98)
MEMORY ARRANGEMENT
(100)

FIGURE 6